# ECONOMIC EFFICIENCY ANALYSIS OF TOURISM SECTOR IN OECD COUNTRIES: AN EMPRICAL STUDY WITH DEA

*Rıza BAYRAK*[1] *Ozan BAHAR*[2]

**Abstract**

In this study we aim to analyze the efficiency of tourism potential of OECD countries in terms of economics perspective with the data of 2011-2015 years. Number of arrivals (NoA), tourism expenditures (TE) and logistic performance index (LPI) were used as input variables; while tourism revenues (TR) as output variables in accordance with the data acquired from World Bank (WB). Both statical and dynamic DEA were conducted with output oriented models. Considering the results of both the CCR ad BCC models as a whole; USA, Australia, Spain, Luxembourg, Portugal, Turkey and New Zealand were efficient countries in all years. Taking into account the required improvements of the variables of the inefficient countries, it is possible to say that tourism expenditure of the inefficient countries should be decreased approximately 2%. Moreover, it could be put forwarded that tourism revenues should be increased approximately 92%. As a result of a dynamic analysis, eight countries (USA, Australia, Spain, Luxembourg, Portugal, Turkey, New Zealand and Greece) were observed to be efficient DMUs according to both the CCR and BCC models.

***Key Words:*** Tourism Sector, Economic Efficiency Analysis, Data Envelopment Analysis (DEA).
***JEL Classification:*** E02, E20, E21

# OECD ÜLKELERİ TURİZM SEKTÖRÜNÜN EKONOMİK ETKİNLİK ANALİZİ: VZA İLE AMPRİK BİR UYGULAMA

**Öz**

Bu çalışmada, 2011-2015 yıllarına ait verilerle OECD ülkelerinin turizm etkinliğinin iktisadi analizi yapılmaya çalışılmıştır. Çalışmada, girdi değişkeni olarak gelen yolcu sayısı, turizm harcamaları, lojistik performans endeksi; çıktı değişkeni olarak da turizm gelirleri olmak üzere toplam dört değişken kullanılmıştır. Veriler, Dünya Bankası veri tabanından elde edilmiştir. Analiz yöntemi olarak, statik ve dinamik Veri Zarflama Analizi (VZA)'nin çıktıya yönelik modelleri kullanılmıştır. Analiz neticesinde; ABD, Avustralya, İspanya, Lüksemburg, Portekiz, Türkiye ve Yeni Zelanda'nın hem CCR hem de BCC çıktı yönelimli model sonucunda tüm yıllarda etkin ülkeler olduğu gözlenmiştir. Etkin olmayan ülkelerin değişkenler bazında yapmaları gereken iyileştirme değerleri incelendiğinde; turizm harcamalarının yaklaşık %2 azaltılması ve turizm gelirlerinin de yaklaşık %92 artırılması gerektiği ortaya çıkmıştır. Beş yıllık verilerin topluca değerlendirildiği dinamik analiz sonucunda CCR ve BCC çıktı yönelimli modele göre ABD, Avustralya, İspanya, Lüksemburg, Portekiz, Türkiye, Yeni Zelanda ve Yunanistan'ın etkin ülkeler olduğu gözlenmiştir.

***Anahtar Kelimeler:*** Turizm Sektörü, Ekonomik Etkinlik Analizi, Veri Zarflama Analizi (VZA).
***JEL Sınıflandırması:*** E02, E20, E21

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**1. Introduction**

Tourism sector, triggered especially from the 1950s in the world, has experienced significant structural change from the beginning of the 1980s in Turkey. It can be said that tourism sector has an inflential effect over the economical structure with creating extarnalities, high employment, balancing geographical disparites and proving foreign currency in way of decreasing current account deficit. Additionally, according to Yanardağ and Avcı (2012:45) tourism sector, compared to others in service sector, seems to be developing fast in recent years. Therefore, moving from these reasons, it can be said that tourism is a strategic sector for whole economy.

World tourism market seems to have reached a figure of about $ 1.5 million dollars in 2014. The dominant countries in this market are the European Union, Asia-Pasific countries and America respectively (United Nations World Trade Organization-UNWTO, 2015). Considering the huge international tourism market; Turkey seems to have quite low share at both the reginonal and global level in this increasingly competitive environment. Also in the light of these facts, Turkey should be said to ensure and maintain resource efficiency to get the desired share of the tourism market in this highly competitive environment in the world tourism sector.

In this context; conceptual issues were decribed in the first part of the study. The methodology and analysis method used were explained in the second part of the study. Then, the findings obtained were discussed in the framework of the relevant literature. In the last part of the study, a number of proposals developed for policy makers in decision-making positions was listed. Additionally some implications for future studies to be conducted in the academic field was declared.

**2. Literature Overview**

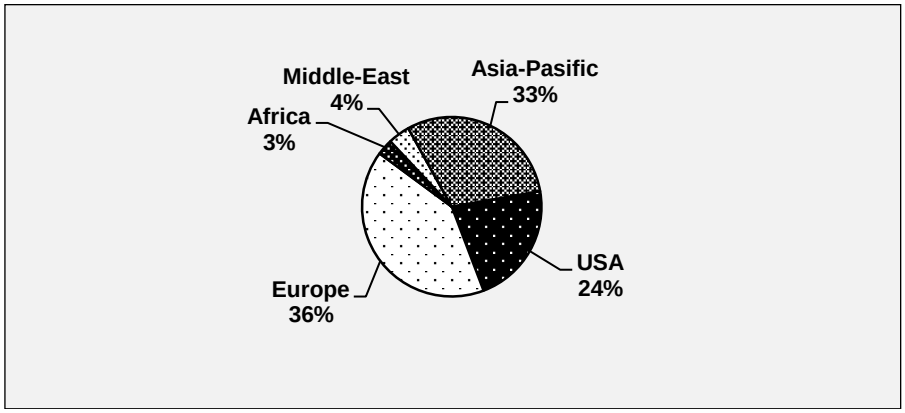
**2.1. Tourism Sector**

Because of the limited use of technology, mechanization and automation facilities; the main feature of tourism within the service sectors is that it is a labor-intensive sector (İçöz and Kozak, 1998:219; Ünlüönen et al., 2007:165; Bahar and Kozak, 2008:135). Therefore, it is said that it can play an effective role in creating employment especially in developing economies and elimination of unemployment (Yanardağ and Avcı, 2012:42). At this point, employment created can be seperated into three types. These are “direct employment” that has emerged directly in serving tourism businesses such as hotel, motel and restourant; “indirect employment” that has provided product and service input to meet the needs of tourism businesses; and “triggered employment” emerging as an additional employment with spending of the revenue gained (Dinçer, 1993:74). In this context, tourism sector is said to be serious solution for developing countries which have especially high unemployment rate (Ünlüönen and Şahin, 2011:22).

Another advantage of the tourism sector is to provide fast and high employment with low cost. Within the scope of index created with the total investment value of the projects and the targeted number of employment provided by the investment, tourism index value is 100; while this value is 126.8 in mining sector, 136.7 in animal husbandry sector, 149.1 in textile-clothing industry, 182.5 in iron and steel industry, 1650.9 in transportation sector and 1985.9 in energy sector (TÜROFED, 2010:7).

The regional distribution of the world's total tourism revenue in 2015 is presented in Figure 1 and Table 1 below.

Figure 1: **Continental Distribution of World Tourism Revenue in 2015**




**Reference:** UNWTO Tourism Higlights, 2016. http://www.e-unwto.org/doi/pdf/ 10.18111/ 9789284418145

Table 1: **Distribution of The World Tourism Revenue in 2015 ($ billion)**

| | USA | Europe | Africa | Middle-East | Asia-Pasific | Total |
|---|---|---|---|---|---|---|
| Amount of Revenue | 304 | 451 | 33 | 54 | 418 | 1260 |

**Reference:** UNWTO Tourism Higlights, 2016. http://www.eunwto.org/doi/pdf/ 10.18111/ 9789284418145

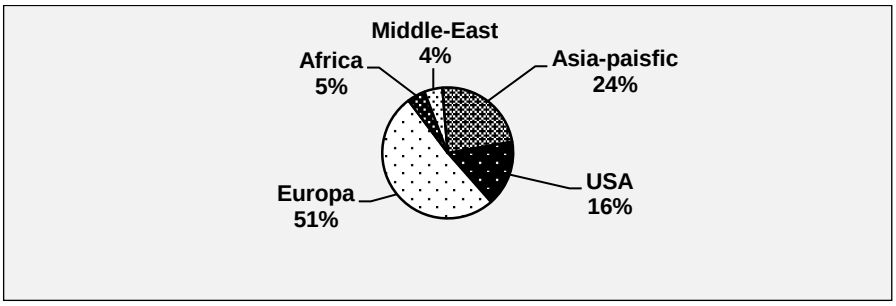
It is seen that the European countries took the largest share with 36% ($ 451 billion) from the world tourism market which is about 1 trillion 260 billion dollars; Asia-Pacific countries is in the second place with 33% (418 billion dollars) market share; and America is in the third place with 24% share. Besides that, the shares of Africa and the Middle East countries are 3% ($ 33 billion) and 4% ($ 54 billion) respectively, which seem to be quite little.

Table 2: **Continental Distribution of Tourist Number Around The World in 2015 ($ million)**

| | USA | Europe | Africa | Middle-East | Asia-Pasific | Total |
|---|---|---|---|---|---|---|
| Number | 193 | 608 | 53 | 53 | 279 | 1186 |

**Reference:** UNWTO Tourism Higlights, 2016. http://www.eunwto.org/doi/pdf/10.18111/ 9789284418145

Figure 2: **Continental Distribution of Tourist Number Around The World in 2015**




**Reference:** UNWTO Tourism Higlights, 2016. http://www.eunwto.org/doi/pdf/10.18111/ 9789284418145

Considering Table 2 and Figure 2; as of 2015, about 1 trillion 186 billion people as tourists seem to be hosted around the world. It is observed that nearly 51% (608 million) of them have chosen to visit the Europe, 24% (279 million) of them to Asia-Pacific countries, 16% (193 million) of them to America, 5% (53 million) of them to Africa and 4% (53 million) of them to Middle Eastern countries respectively.

Additionally at the same time, as of 2015, revenues from international passenger transportation have reached nearly to 211 billion dollars. Together with this amount, the economic value of tourism market seems to be about 1.5 trillion in 2015 or US$ 4 billion a day on average. Also, international tourism revenues is 6% of exports of goods and services all over the world. Considering only the export of services, international tourism revenues constitute about 30% of it (UNWTO, 2016:3).

Examining the tourism expenditures in 2015, China, USA, Germany, United Kingdom, France, Russia, Canada, Korea, Italy, Australia seem to have the highest tourism expenditure respectively in the world (UNWTO, 2016:13).

**2.2. Performance and Efficiency**

Performance, originated from French, is translated as business success, the degree of success obtained in any work (Bozkurt, 1998:203). Defining performance as economic terms, it is possible to state that performance is a term which evaluates the results of various economic activities such as growth, employment, inflation rates, wealth and income distribution in terms of individual and social welfare (Schmitter, 2004:17).

It is known that the term of organizational performance, which was started to be discussed in 1950s, is defined as the degree of achievement of organizational goals by the use of organizational resources in accordance with the organizational capacity (Efil, 2006:17). In other words, performance has not a different meaning from described above. The performance of a company can be described as interaction of functional parts of a company and the total result generated by their joint efforts (Akal, 2002:10).

The main study revealing the dimension of organizational performance in literature and also considered to be classic approach to performance is the model of Sink and Tuttle. According to the model, the dimensions of the performance of an organizational system are described as follows (Rohlstadas, 1998:989-991).

- Efficiency and effetiveness,
- Productivity,
- Quality,
- Quality of the working life,
- Innovation,
- Profitableness and propriety of budget.

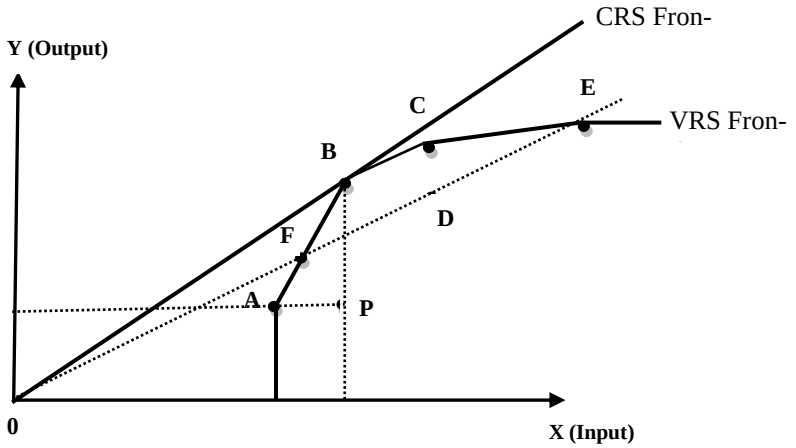
It is seen that the term of efficiency as a performance indicator is evaluated with many different definitions according to the discipline studied up to now. The efficiency as a terms of the economics is “L’efficacite” in French and “Efficiency” in English and defined as the capacity to obtain maximum results with minimum effort or expense (Kök, 1991:45). The term of efficiency can be stated as obtaining the maximum output using a specific combination of inputs or obtaining a specific combination of output using minimal input within the framework of avaliable technology and time (Tarım, 2001:14).

Examining the literature of efficiency, the kinds of efficiency are generally listed as technical efficiency, structural efficiency, scale efficiency, allocation efficiency and economic efficiency.

*Technical efficiency*: Technical efficiency is physical activity in the process of converting inputs into outputs. This case includes capacity utilization and technological development (Silver and Lowe, 2001:31). A frontier, which can be achieved as a high output with the best combination of inputs, is defined to be production frontier (Aktaş, 2001:164). Thus, examining in the context of production limits, if a production unit is on the production frontier, this unit can be said to be a technical efficient. However, a production unit is below this frontier, so it is possible to say that it is inefficient and wasting resources (Kumbhakar and Lovell, 2000:42-50).

In Figure 3 an efficiency measurement is shown in terms of input-output. Production posibility sets in which all input-output compounds are feasible between production limit and X-axis is seen here. Because A,F,B, C and E production units are on the efficient frontier, these are said to be technical efficient units. Although unit "P" uses more input compared to "A", it only produce output equal to "A". Moreover, the unit "P" uses the same input with "B", but it produce less output than "B". Also, taking into consideration these reasons and moving in the direction of "A" or "B", the unit "P" could be efficient (Tarım, 2001:18-19).

Figure 3: **Measuring of Efficiency According to Farrell (In terms of Input and Output)**




*Structural Efficiency:* If a manufacturer produces in a manner of technical efficiency in the economical area of production, this process can be defined as structural efficient. On the other hand, if this process is outside the economical area of production, this situation could be described as structural inefficiency (Färe et al., 1988:8-11).

*Scale Efficiency:* The more production scale increases, the more the average cost decreases. This situation could be determined to be scale effiiciency. In Figure 3 production frontier discussed in this context also shows variable returns to scale (VRS). Thus, In Figure 3 the company indicated with the combination of B can be determined to produce in the most productive scale size (MPSS) and additionally, in the technical optimum efficiency scale (TOPS) (Tarım, 2001:20; Coelli et al., 2005:58-59).

*Allocation Efficiency:* Allocation efficiency or price efficiency in other phrase means choosing the most appropriate compound of inputs/factors by the economic units (Sengupta, 1995:15).

*Economical Effciency / Total Efficiency:* As seen in the formula 1, economic efficiency/total efficieny is the multiplication of technical efficiency by allocation efficiency (Worthington, 2001:247-248).

$$EE = TE \times AE \quad (1)$$

**2.3. Studies Conducted in the Field**

Considering the literature; although there are many studies of efficiency and poductivity by using Data Envelopment Analysis (DEA) in various sectors such as banking and finance sector, educational institutions and manufacturing companies, which are homegeneous structures, it is seen that the amount of studies conducted for tourism potential in terms of productivity and efficiency appears to be quite limited. Many of them were also concentrated on effectiveness of hotels and tourism companies (Hwang and Chang, 2003; Aksu and Köksal, 2005; Erciş and Gülcü, 2008; Babacan and Özcan, 2009; Emir et all., 2010; Uyar and Alış, 2014; Toma, 2014; Yakut et al., 2015).

The only study on tourism efficiency with DEA in the literature is the study conducted by Atan and Aslantürk (2015). Therefore, it is possible to express that our study is original one in the area of tourism efficiency.

**3. Data and Methods**

**3.1. Data**

In this section, some explanations has been made regarding the data and analysis methods used in study.

As known, the number of arrivals is an important indicator while comparing the countries' tourism size (UNWTO Tourism Higlights, 2016:3). Taking into account this reality, the number of arrivals (NoA) was included as the first input variable of the study.

This study is mainly based on economic logic. That is, the efficiecy measurement of the countries was indeed handled in an economic perspective. So, tourism expenditure (TE) of the countries was included as second input variable to indicate that the costs of the production factors was covered in the study.

It can be put forwarded that logistic ability/capacity is so important for a country to make future prediction. Therefore, from the need to cover the logistic abilities of the countries, logistics performance index (LPE) was included as third input variables.

Tourism revenues is of great significance for the countries that need especially foreign capital. Additionally, tourism revenues (TR) is an important and commonly used indicator to rank the the country' tourism efficiency (UNWTO Tourism Higlights, 2016:3). Thereof tourism revenues of the countries was included as output variable.

Examining the literrature, it was seen that Atan and Arslantürk (2015) has prefered to analyze the number arrivals (as input variable), tourism expenditure (as input variable) and tourism revenues (as output variables) to estimate the efficiencies of the decision making units, that is to say, countries.

The data selected for that study was allowed to cover the five years time (2011-2015) to make sound comparisons about countries' efficiencies.

Relavant information about variables such as type, definition and source was presented in Table 3.

Table 3: **Definition of The Variables**

| Variable | Definition | Source |
|---|---|---|
| **NoA** | Number of arrivals | Statistic Data Bank of World Bank* |
| **TE** | Tourism expenditure | Statistic Data Bank of World Bank* |
| **LPI** | Logistic performance index | Statistic Data Bank of World Bank* |
| **TR** | Tourism revenues | Statistic Data Bank of World Bank* |

**Reference:** UNWTO Tourism Higlights, 2016. http://www.e-unwto.org/doi/pdf/10.18111/9789284418145

### 3.2. Analysis Method

Data Envelopment Analysis (DEA) used in study is a method based on frontier approach. This method tries to measure the relative efficiency of homogenous decision making units (DMU) using the same input and producing the same outputs (Ramanathan, 2003:19). DEA has been developed to measure the relative effectiveness of economic units and it is an efficiecy measurement technique using no parameter (Yavuz, 2001:7; Yolalan, 1993:27). In other words, DEA is a technique which measures relative efficiency of DMUs using different inputs and outputs defined in different kind of measures (Kecek, 2010:55).

The fractional CRR programming model is the first model developed by Charnes, Cooper and Rhodes; and was formed by proportion of weighted outputs to weighted inputs for each decision making unit (Charnes et al., 1978:430).

Fractional programming model for CCR output used in the study and accepted as one of the DEA model in the literature is defined as seen in the equation (2). This model consisting of ratio of weighted output to weighted inputs minimizes the objective function (Yolalan, 1993:43-44). In the model, (m) is used input number and (s) is used as the output number. Efficiency value for (n) times DMUs is measured as the ratio of weighted inputs to weighted outputs.

$$F_k = \text{Minimum} \frac{\sum_{i=1}^{m} v_{ik} X_{ik}}{\sum_{r=1}^{s} u_{rk} Y_{rk}} \tag{2}$$

$$\frac{\sum_{i=1}^{m} v_{ik} X_{ij}}{\sum_{r=1}^{s} u_{rk} Y_{rj}} \geq 1 \qquad j=1,\ldots,n$$

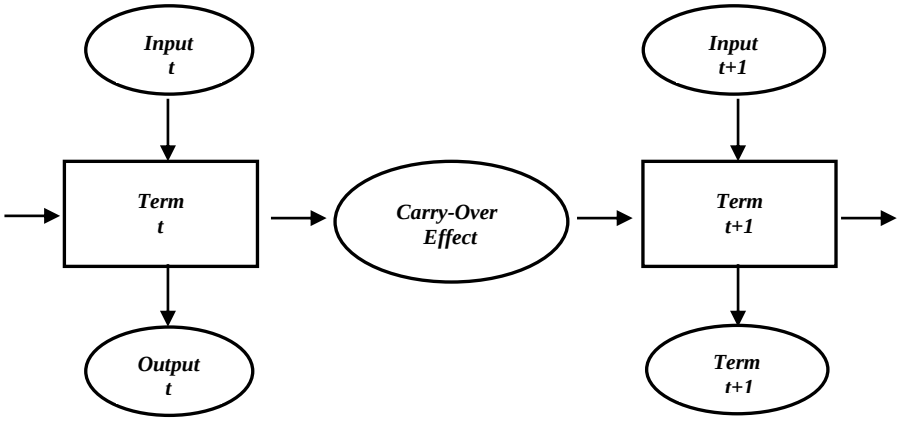
$$u_{rk},\ v_{ik} \geq \varepsilon \quad r=1,\ldots,s \ ; \quad i=1,\ldots,m$$

Here, (s) is the number of produced output; (m) is the number of input used; ($u_{rk}$) is the weight given to the ($r^{th}$) output by the decision unit (k); ($Y_{rk}$) is ($r^{th}$) amount of output produced by the decision unit (k); ($v_{ik}$) is the weight given to the ($i^{th}$) input by the decision unit (k); ($X_{ik}$) is ($i^{th}$) amount of input used by the decision unit (k); (n) is the number of decision making unit; ($F_k$) is the efficiency value of the decision unit (k); ($Y_{rj}$) is ($r^{th}$) amount of output produced by the decision unit ($j^{th}$); ($X_{ij}$) is ($i^{th}$) amount of input used by the decision unit ($j^{th}$).

The second analysis conducted in this study is the dynamic DEA model. The dynamic model take into account input-output dependency arising from lagged outputs (Emrouznejad and Thannassoulis, 2005). In other words, static DEA models normally neglect time dependent variables (Tone and Tsutsui, 2009:243). For taht pupose, the dynamic DEA was developed to overcome this barrier.

The Dynamic DEA model developed by Tone ve Tsutsui (2010) was presented below in Figure 4. As seen in the Figure 4, the term “carry-over effect” was used to describe possitive and negative effects carried between the terms (Tone ve Tsutsui, 2010:146).

Figure 4: **Dynamic DEA Model**




The mathematical formulation of the Dynamic DEA Model developed Sengupta (1996) is seen below in (3) and (4) equations (Repkova, 2013:269).

$$\max (T-1) = \sum_{t=0}^{T-1} \sum_{j=1}^{n} w^{l}(t) \lambda_{j}(t) \tag{3}$$

$$\sum_{j=1}^{n} A_{j}(t) \lambda_{j}(t) \leq X_{k}(t) \tag{4}$$

$\lambda_j (t) \geq 0,\ t=0,1,2,\ldots,T-1$

Where $\boldsymbol{\lambda_j\ (t),}$ represents output vector for all DMUs; $\boldsymbol{X_k,}$ represents current input; $\boldsymbol{A_j}\ (t)$, represents related input coefficient matrix; $\boldsymbol{w_t,}$ represents non-negative weight vector for multiple outputs of all DMUs.

In dynamic DEA analysis, the model of CRS depending on the basis of constant returns to scale in Data Envelopment Analysis is defined as the model of CCR, because the model was developed by Charnes, Cooper and Rhodes (1978). The model of VRS depending on the basis of variable returns to scale is also known as the model of BCC, because the model was developed by Banker, Charnes and Cooper (Cooper et al., 2011:12). Optimal score value in the input-oriented models is among $\mathbf{0 \leq \theta_0^* \leq 1}$ (Farrel, 1957); whereas it is $\mathbf{1 \leq \theta_0^* \leq \infty}$ in the output-oriented models (Cooper et al., 2000:28). In other words, the score of efficiency increases as it approaches the value of "1", but it decreases in case of moving away from the value of "1".

**4. The Results and Discussion**

As a result of analysis, efficiency values acquired by countries for five-years period (2011-2015) was presented in Table 4.

Table 4: **Efficiency Values of Countries Between 2011-2015**

| Countries | CCR Output Oriented Model | | | | | BCC Output Oriented Model | | | | 2015 |
|---|---|---|---|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2013 | 2014 | 2015 | 2011 | 2012 | 2013 | 2014 | |
| Germany | 55,27 | 50,31 | 51,81 | 49,87 | 40,68 | 56,28 | 51,02 | 52,35 | 50,26 | 40,95 |
| United States | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Australia | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |
| Austria | 64,05 | 61,97 | 62,02 | 58,09 | 56,57 | 65,14 | 63,23 | 62,90 | 58,48 | 57,12 |
| Belgium | 49,52 | 50,33 | 49,78 | 46,05 | 43,78 | 49,62 | 50,41 | 49,86 | 46,13 | 43,81 |
| C. Republic | 57,13 | 53,12 | 48,72 | 46,92 | 46,41 | 63,44 | 68,37 | 65,53 | 50,64 | 52,48 |
| Denmark | 31,52 | 30,24 | 30,03 | 31,31 | 28,83 | 31,76 | 30,42 | 30,12 | 31,41 | 29,10 |
| Estonia | 48,17 | 41,98 | 40,52 | 45,96 | 42,40 | **100** | **100** | **100** | **100** | **100** |
| Finland | 46,81 | 47,35 | 48,16 | 38,55 | 28,33 | 47,44 | 47,91 | 48,31 | 44,26 | 28,37 |
| France | 60,60 | 63,31 | 61,10 | 54,11 | 44,19 | 61,55 | 64,03 | 61,71 | 54,45 | 44,77 |
| Netherland | 61,03 | 59,78 | 62,50 | 45,54 | 45,28 | 61,22 | 60,00 | 62,66 | 45,67 | 45,57 |
| U. Kingdom | 48,30 | 48,42 | 49,18 | 53,35 | 53,16 | 48,31 | 48,42 | 48,18 | 53,51 | 53,24 |
| Ireland | 55,68 | 57,04 | 54,31 | 60,74 | 64,64 | 55,87 | 58,69 | 54,3 | 61,07 | 65,15 |
| Spain | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |
| Israel | 68,34 | 72,10 | 71,88 | 63,55 | 64,32 | 72,56 | 82,02 | 85,11 | 83,66 | 80,46 |
| Sweden | 59,59 | 59,87 | 61,87 | 52,73 | 49,12 | 59,77 | 60,02 | 62,00 | 52,89 | 49,16 |
| Switzerland | 77,28 | 74,00 | 70,71 | 67,06 | 62,22 | 77,51 | 74,15 | 70,78 | 67,15 | 62,25 |
| Italy | 58,84 | 60,19 | 62,48 | 61,20 | 53,60 | 58,90 | 60,22 | 71,34 | 61,69 | 54,58 |
| Iceland | 47,08 | 50,84 | 55,14 | 56,89 | 63,79 | 57,81 | 65,66 | 67,90 | **100** | **100** |
| Japon | 34,11 | 38,60 | 42,67 | 45,55 | 50,17 | 35,51 | 39,79 | 42,72 | 45,64 | 50,40 |
| Canada | 35,40 | 36,23 | 33,17 | 34,70 | 26,30 | 35,43 | 36,24 | 33,18 | 34,71 | 26,30 |
| South Korea | 53,35 | 54,12 | 50,84 | 50,64 | 44,03 | 53,36 | 54,15 | 50,84 | 50,69 | 44,33 |
| Luxembourg | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |
| Hungary | 59,46 | 52,42 | 53,74 | 83,57 | 87,34 | 62,47 | 56,25 | 57,13 | **100** | **100** |
| Mexico | 41,59 | 43,25 | 42,30 | 41,46 | 46,75 | 49,30 | 47,88 | 47,75 | **100** | **100** |
| Norvay | 31,35 | 29,17 | 30,40 | 32,14 | 28,28 | 31,44 | 29,18 | 30,44 | 32,28 | 28,31 |
| Poland | 50,21 | 49,41 | 48,28 | 47,39 | 43,99 | 55,98 | 53,56 | 60,71 | 65,11 | 68,87 |
| Portugal | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |
| Slovakia | 29,24 | 26,62 | 26,94 | 52,71 | 44,92 | 32,46 | 31,94 | 37,31 | **100** | **100** |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Slovenia | 73,63 | 76,36 | 77,61 | 71,74 | 71,46 | **100** | **100** | **100** | **100** | **100** |
| Chile | 44,19 | 43,50 | 42,65 | 40,19 | 42,24 | 51,13 | 52,40 | 61,40 | 60,77 | 54,23 |
| Turkey | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |
| New Zealand | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** | **100** |
| Greece | 95,29 | 91,47 | 90,39 | 82,76 | 76,93 | **100** | **100** | **100** | **100** | **100** |
| Average | 62,85 | 62,41 | 62,32 | 62,19 | 60,28 | 66,89 | 67,70 | 68,51 | 72,07 | 69,98 |
| Standart Deviation | 23,42 | 23,54 | 23,53 | 22,87 | 24,42 | 24,09 | 24,67 | 24,31 | 25,55 | 27,70 |
| Inefficient DMUs | 27 | 27 | 27 | 27 | 27 | 24 | 24 | 24 | 20 | 20 |

**Source:** Created by authors with DEA Frontier Analyst 2.0 programme.

According to static analysis performed by the CCR method; America, Australia, Spain, Luxembourg, Portugal, Turkey and New Zeland were observed to be efficienct countries for this five years period, but the other countries remained below the efficiency frontier in all years. In other words, they were observed to be inefficient ones. The average of efficiency scores of all countries decreased at a rate of approximately 2% in 2015 compared to taht of previous years.

In the study conducted by Atan and Aslantürk (2015) with the data covering five years (2006-2010) America, Australia, Spain, Luxembourg, Portugal and Turkey were observed as efficient DMUs in all years. Also, it can be stated that our findings are consistent with the study of Atan and Aslantürk (2015).

As a result of static analysis applied according to BCC method; it was observed that America, Australia, Estonia, Spain, Luxembourg, Portugal, Slovenia, Turkey, New Zeland and Greece were efficient DMUs in all years, whereas other countries were inefficient ones.

It was observed that average efficiency scores obtained from the BCC method were higher than that of CCR method. This finding is consistent with some studies conducted in the literature (Bakırcı, 2006; Kurtlar and Babacan, 2008; Bayrak et al, 2016; Tatlı and Bayrak, 2016).

The values to improve the input and output levels of the countries for this five-years period are summarized in Table 5.

Table 5: **Total Improvement Values of DMUs (%)**

| Variable | 2011 | 2012 | 2013 | 2014 | 2015 | Average |
|---|---|---|---|---|---|---|
| **NoA** | - | - | - | - | - | |
| **TE** | -1,83 | -1,09 | -4,7 | -1,77 | -1,51 | -2.18 |
| **LPI** | - | - | - | - | - | |
| **TR** | 92,37 | 93,46 | 88,52 | 94,04 | 93,76 | 92,43 |

**Source:** Created by authors with DEA Frontier Analyst 2.0 programme.

Considering the values in Table 5; it is necessary that tourism expenditure of the countries should be decreased approximately 2% to reach efficient frontier. Moreover, it may be implied that tourism revenues should be increased approximately 92%.

Examining the reference number of the effecient countries to the ineffcient ones in Table 6, it is seen that America took the first place with obvious difference with 97 times. Turkey got the last rank in the list with 12 times.

Table 6: **Reference Frequency of Eficient DMUs According to CCR Model**

| Countries | Number of Frequency | | | | | |
|---|---|---|---|---|---|---|
| | 2011 | 2012 | 2013 | 2014 | 2015 | Total |
| **United States** | 20 | 20 | 20 | 17 | 20 | 97 |
| **Portugal** | 12 | 11 | 10 | 8 | 6 | 47 |
| **Australia** | 9 | 9 | 7 | 8 | 9 | 42 |
| **Luxembourg** | 8 | 7 | 8 | 11 | 6 | 41 |
| **New Zealand** | 9 | 9 | 8 | 3 | 8 | 37 |
| **Spain** | 4 | 3 | 2 | 2 | 2 | 13 |
| **Turkey** | 2 | 3 | 1 | 3 | 3 | 12 |

**Source:** Created by authors with DEA Frontier Analyst 2.0 programme.

The efficiency scores obtained from the dynamic analysis with five-years data is presented in Table 7.

Table 7: **The Results of Dynamic Analysis of Countries**

| Countries | CCR (CRS) Output Oriented Model | BCC (VRS) Output Oriented Model |
|---|---|---|
| | 2011-2015 | 2011-2015 |
| **Germany** | 1.76 | 1,73 |
| **United States** | **1** | **1** |
| **Australia** | **1** | **1** |
| **Austria** | 1,34 | 1,33 |
| **Belgium** | 1,84 | 1,73 |
| **Czech Republic** | 1,56 | 1,13 |
| **Denmark** | 1,77 | 1,65 |
| **Estonia** | 1,84 | **1** |
| **Finland** | 1,37 | 1,24 |
| **France** | 1,52 | 1,50 |
| **Netherland** | 1,51 | 1,41 |
| **United Kingdom** | 1,82 | 1,79 |
| **Ireland** | 1,53 | 1,48 |
| **Spain** | **1** | **1** |
| **Israel** | 1,24 | **1** |
| **Sweden** | 1,45 | 1,42 |
| **Switzerland** | 1,17 | 1,16 |
| **Italy** | 1,43 | 1,17 |
| **Iceland** | 1,21 | **1** |
| **Japon** | 1,14 | 1,13 |
| **Canada** | 1,88 | 1,30 |
| **South Korea** | 1,74 | 1,69 |
| **Luxembourg** | **1** | **1** |
| **Hungary** | 1,02 | **1** |
| **Mexico** | 1,80 | **1** |
| **Norvay** | 1,82 | 1,65 |
| **Poland** | 1,92 | **1** |
| **Portugal** | **1** | **1** |
| **Slovakia** | 1,59 | **1** |
| **Slovenia** | 1,15 | **1** |
| **Chile** | 1,91 | **1** |

| | | |
|---|---|---|
| **Turkey** | **1** | **1** |
| **New Zealand** | **1** | **1** |
| **Greece** | **1** | **1** |
| **Average** | 1,40 | 1,20 |
| **Standart Deviation** | 0,33 | 0,26 |
| **Inefficient DMUs** | 26 | 17 |

**Source:** Created by authors with DEA Professional 2007 pragramme.

Moving from Table 7, eight countries (America, Australia, Spain, Luxembourg, Portugal, Turkey, New Zeland, Greece) were observed to be efficient DMUs as a result of the dynamic analysis according to the CRS model. But according to the results of VRS model, 17 countries (America, Australia, Estonia, Spain, Israel, Iceland, Luxembourg, Hungary, Mexico, Poland, Portugal, Slovenia, Slovakia, Chile, Turkey, New Zeland, Greece) seemed to be efficient DMUs. In other words, it is possible to say that the VRS model produces better results than the CRS model. This situation is consistent with some studies (Bayrak et al, 2016; Tatlı and Bayrak, 2016) in the literature.

The result of super-efficiency analysis, applied to evaluate the ranking of total eight efficient countries (according to CCR model) is seen in Table 8.

Table 8: **Super Efficiency Values of Efficient DMUs According to CCR (CRS) Model**

| Countries | 2011-2015 |
|---|---|
| **New Zealand** | 0,89 |
| **Greece** | 0.85 |
| **Portugal** | 0,76 |
| **Luxembourg** | 0,68 |
| **Spain** | 0,66 |
| **Turkey** | 0,59 |
| **Australia** | 0,55 |
| **United States** | 0,25 |

**Source:** Created by authors with DEA Professional 2007 pragramme.

It was observed that New Zeland, Greece and Portugal took the first three places as the most efficient decision-making units in this five-years period.

**5. Conclusions and Recommendations**

Considering that the world tourism market is approximately 1.5 trillion dollars and the intensity of competition in the tourism market continues in a increasing manner, it can be said for countries that maintaining competitive advantage by means of resource efficiency is quite important. Also moving from these reasons, economic efficiency of the tourism potential of the OECD countries were analyzed in this study.

According to the CCR method used in the study, USA, Australia, Spain, Luxembourg, Portugal, Turkey and New Zeland were observed to be efficienct countries in all years. As a result of static analysis, applied according to BCC method, USA, Australia, Estonia, Spain, Luxembourg, Portugal, Slovenia, Turkey, New Zeland and Greece were efficient DMUs in all years. Iceland, Hungary, Mexico and Slovakia were found to be efficient countries in 2014 and 2015 additionally. Considering both the results of the CCR ad BCC models as a whole; USA, Australia, Spain, Luxembourg, Portugal, Turkey and New Zealand were efficient countries in all years.

Examining the required improvements in some variables to reach efficiency frontier, it is necessary that tourism expenditure of the countries should be decreased approximately 2% to reach efficient frontier. Moreover, it could be put forwarded that tourism revenues should be

increased approximately 92%. In other words, it may be acknowledged that the countries face some difficulties on the market and therefore they need to increase their share of the tourism market. Additionally taking into account reference number of the efficient countries to the inefficient ones; America seemed to be in the first place with an obvious difference with 97 times. Turkey got the last rank in the list with 12 times.

As a result of a dynamic analysis evaluating the five-years period concurrently, eight countries (USA, Australia, Spain, Luxembourg, Portugal, Turkey, New Zealand and Greece) were observed to be efficient DMUs according to the CCR model. Additionally, nine countries (Estonia, Israel, Iceland, Hungary, Mexico, Poland, Slovenia, Slovakia, Chile) seemed to be efficient according to the BCC model. Moreover, when examined the ranking of the efficient countries, New Zealand seemed to take first place. Greece and Portugal followed it respectively.

Taken into account the results of both statical and dynamic analysis as a whole; USA, Australia, Luxembourg, Portugal, Turkey and New Zealand seemed to be efficient countries in all years. In other words, these countries were observed to be at the efficient frontier. Moreover, it is possible to put forward that they were successful in using their resources.

As for inefficient countries; some European countries such as Germany, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Netherland, Sweden, Switzerland, Italy, Iceland, Hungary, Norway, Poland, Slovakia, Slovenia seemed to have used their economic sources inefficiently. These countries were below the efficient border not only according to the results of statical analysis but at the same time dynamic analysis covering five years data concurrently. As mentioned before (see Figure 1, Figure 2, Table 1 and Table 2), Europe has approximately 608 million (51%) arrivals and 451 US$ billion (36%) tourism revenue. This means that there is a fallacy though Europe has the main share of the world tourism. For instance France, Spain, Italy, Germany are in the top ten in terms of tourism arrivals (UNWTO Tourism Higlights, 2016:6). As a result, it could be pointed out that these inefficient European countries need to take some political measures according to their needs to reach efficient frontier.

The United Kingdom and Ireland were observed to have used their sources inefficiently. That is, they were also below the efficient frontier. These results are valid in terms of dynamical analysis that covers the data as a whole. The United Kingdom is in the top ten as of 2015 in terms of not only tourism arrivals but also tourism revenues (UNWTO Tourism Higlights, 2016:6). Therefore it could be proposed that these countries need to evaluate the use of resources and take strict measures to obtain efficient border.

Canada, Mexico, and Chile were among the inefficient countries in terms of not only statical analysis but also dynamical analysis. According to reports (UNWTO Tourism Highlights, 2016:6), America (as a continent) has 193 million (16%) arrivals and 304 US$ billion (24%) tourism revenues. At the same time, Mexico is in the top ten in terms of tourism arrivals. In sum, these countries have some drawbacks though they have a huge body of share in the tourism market. That is, these countries need to evaluate their position in the world market and take precautions to reach the efficient border.

Isreal was below the efficient border according to the results of both statical and dynamic analysis (only in CCR methods). This is because Middle east 53 million (4%) arrivals and 54 US$ billion (4%) tourism revenues (UNWTO Tourism Highlights, 2016:3). These indicators mean that this part of the world has the smallest share of the world tourism market. It may be postulated that some kind of conflicts prolonged in the region hinder tourism revenues. Therefore, Israel should take some precautions to reach the efficient border by examining Turkey's practises.

Asia and the Pacific have 279 million (24%) arrivals and 418 US$ billion (33%) tourism revenues (UNWTO Tourism Highlights, 2016:6). This means that this region has a huge share of the world market (See Figure 2). But in spite of this reality, Japan and South Korea were under the efficient border according to both statical and dynamic analysis. That is, they may be said to be using their

resources inefficiently. At this point it possible to express that they are required to decrease redundant spendings on the one hand and try to evaluate their process and take some important measures to be efficient ones.

The recommendations developed for the policy makers of the countries (inefficient ones) in the decision-making positions and for the future studies to be conducted in the academic field have been expressed below.

When examined the developed countries in the tourism sector; it is seen that the main factors that make countries more interesting and attractive are not only financial resources, investment style, the nature or history, but also human who has evaluated and presented them and also additionally organizational power as main factors (Ilkiz and Hitay, 1992:159). Thus, the employment of the educated workforce that will be able to make a difference in this highly competitive environment is said to be extremely important. In this context, it can be implied that providing the desirable developments in the education might be appropriate to meet the demand of skilled labor required in the tourism businesses.

**6. Restrictions of the Study and Future Implications**

It is possible to say that the main restrictions of this emprical study are data sets covering 2011-2015, Data Envelopment Analysis used as analysis method, DEA Frontier Analyst 2.0 and DEA Professional 2007 programmes used for the analysis. At the same time, the types and number of variables choosen for this study may be said to be another restrictions of the study.

This study is a relative analysis in itself. In other words, efficiency scores obtained are not precise values. Also, these efficiency values were obtained only with these variables, and analysis programmes. Therefore, if the type and number of variables, data and analysis programmes used are changed, the results of the study may change accordingly. Therefore, it is possible to express that the validity of findings will be able to enhanced by changing the restrictions of the study.

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